

DOCUMENT RESUME

ED 313 030

IR 014 084

AUTHOR Hill, James R.
TITLE A Software Defined Integrated T1 Digital Network for Voice, Data and Video.
PUB DATE 89
NOTE 9p.; Paper presented at the Annual Meeting of the American Association for Community and Junior Colleges (Washington, DC, March 29-April 1, 1989).
PUB TYPE Reports - Descriptive (141) -- Speeches/Conference Papers (150)

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS Community Colleges; Cost Effectiveness; *Distance Education; Educational Planning; *Information Networks; Information Technology; Office Automation; Program Descriptions; *Telecommunications; *Teleconferencing; Telecourses; Two Year Colleges
IDENTIFIERS *Dallas County Community College District TX

ABSTRACT

The Dallas County Community College District developed and implemented a strategic plan for communications that utilizes a county-wide integrated network to carry voice, data, and video information to nine locations within the district. The network, which was installed and operational by March 1987, utilizes microwave, fiber optics, digital cross connect and T1 technology to provide the first software-defined educational network to merge all three technologies into one common digital pipeline. The plan included provisions for planning and installation of new digital switches for voice, a packet switched-wide area network for data, and compressed video codes for video teleconferencing and instruction. This report describes: (1) the development of the strategic plan; (2) the technology procurement process; (3) the process of planning for installation; and (4) the installation and implementation events. (Author/GL)

* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *

A SOFTWARE DEFINED INTEGRATED
T1 DIGITAL NETWORK FOR VOICE, DATA AND VIDEO

JAMES R. HILL

DIRECTOR OF INFORMATION TECHNOLOGY

DALLAS COUNTY COMMUNITY COLLEGE DISTRICT

DALLAS, TEXAS 75150

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION
CENTER (ERIC)

☒ This document has been reproduced as
received from the person or organization
originating it.

☐ Minor changes have been made to improve
reproduction quality.

• Points of view or opinions stated in this docu-
ment do not necessarily represent official
OERI position or policy.

ED313030

The Dallas County Community College District developed and implemented a strategic plan for communications that utilizes a county-wide integrated network to carry voice, data and video information to nine District locations. Designed by our consulting engineers, Diversified Communications Engineering, Inc., the network utilizes microwave, fiber optics, digital cross connect and T1 technology to provide the first software defined educational network to merge all three technologies into one common digital pipeline. The plan included planning and installation of new digital switches for voice, a packet switched-wide area network for data, and compressed video codecs for video teleconferencing and instruction. The presentation will cover the development of the strategic plan, the procurement process, the planning for installation, and the installation and implementation events. The network was installed and operational by May 1986 and has an anticipated 8 year life span.

"PERMISSION TO REPRODUCE THIS
MATERIAL HAS BEEN GRANTED BY

James R. Hill

IR014084

THE ENVIRONMENT

The Dallas County Community College District is composed of seven campuses and two District offices providing educational support to all Dallas County residents. Campuses are located within fifteen minutes driving time from any residence. The District serves approximately 97,000 students per semester consisting of an equal distribution of credit and non-credit. Campuses vary in size from 5,000 to 25,000 students.

THE PROBLEM

In 1984, communication responsibilities for voice were managed by the District's Facilities Division and data by Computer Services. There were no video communications intra-district, but an extensive telecourse curriculum was distributed throughout the county by the local public television station.

Voice switches were on each campus and were leased from AT&T, with the lease expiring in July 1986. Data circuits were 56KB DDS circuits leased from Southwestern Bell. There were eight circuits running between each campus and the District Service Center where the centralized computing center was located. Costs for voice and data services were \$1.2 million per year and had increased 40% over the preceding three years. Air time for telecourses was running \$175,000 per year and increasing each contract renewal.

Costs were expected to increase for voice communications with lease expiration and increased growth projected. Data communication facilities were in need of expansion at two colleges and office automation needs would require significant new facilities. Strategic planning called for additional telecourse offerings as well as intra-District instruction and teleconferencing.

The problem was coming into focus with these events.

- Expiration of PBX lease
- Additional data communication needs
- Increased video demand
- Merging technologies
- Need to contain operating costs

THE STRATEGY

In July of 1984, Ted Hughes, Vice Chancellor of Business Affairs responded with two actions:

- 1) Placed responsibility for all data, voice, and video communications under Jim Hill, former Director of Computer Services and now the Director of a new division named Information Technology.
- 2) Formed a District-wide committee with Jim Hill as chair with the charge to examine District communication needs and develop a strategic plan for a communication network that would cover a five year time frame.

The Communication Network Planning Committee met for the first time in September 1984 with representation from all campuses and District offices covering a broad spectrum - President; Vice Presidents of Instruction, Students and Business; Faculty; Directors of Purchasing and Facilities for example

The Committee, realizing the technical complexities of such a network, attempted to become more knowledgeable through selected readings, vendor presentations, and attending a conference on communication planning. At the same time, each committee member was given the charge to meet with their respective campus administrative staff or District support area to develop a communication needs analysis for present and future.

It became obvious the complexity of the task, i.e. the use of voice, data, video and image, necessitated the use of a consultant. In March of 1985, the District requested proposals for a consultant, and selected Diversified Communication Engineering (DCS) from Austin, Texas to assist the committee. In June, the committee met with Saleem Tawil, President of DCS, and Carmen Armistead, an associate in the firm. Saleem and Carmen were both licensed electrical engineers, which proved to be critical in later procurement and implementation.

During the next 4 months, the committee, with assistance from DCS, developed strategic objectives from needs assessment developed by the individual committee members, and consolidated by discussions of the full committee. The objectives were:

- Provide control over resources for services and costs
- Develop an integrated network for
- Voice
- Data
- Video
- Image
- Accommodate the present as well as the future (8 years)
- Utilize new technologies, but with restraints (system concepts proposed must have been operational at least one year)
- Provide centralized resources for network control and support
- Adopt digital switching technology
- Must be economical with reasonable payback period
- Provide for video conferencing.

The consulting engineer, Mr. Tawil, with these objectives as the basis, provided a written report to the committee with his recommendations for our strategic plan. Included in the report were the design criteria for new systems; a financial and cost benefit analysis for each element of the proposed system; and options and alternatives with appropriate results/sequences. The consultant recommendations were adopted by the committee and presented to, and approved by, the Board of Trustees in November 1985.

THE STRATEGIC PLAN 1986 - 1994

The foundation of the plan was a software defined, integrated digital network providing voice, data, and video communication paths between all District locations. The location of the campuses within the county provided an ideal environment for a star design microwave network. Interfirst Plaza, at 72 floors the tallest building in Dallas, was across the street from the El Centro campus and was the logical choice for the physical hub with a direct line of site for microwave to all campuses.

Digital switches would be placed on eight sites with the District office sharing the El Centro switch. Data communications would not be switched by the voice switches, but would be accommodated by multiplexors or local area networks connected by the digital network to the main computing facility at the District Service Center.

While the physical hub was located in Interfirst Plaza, it was desired that control of the entire network be placed at the District Service Center 10 miles to the east. The key to this arrangement was to place a Digital Access Cross-Connect (DACS) switch atop Interfirst Plaza which would gather all the incoming voice and data digital traffic coming from the campuses and district offices and drop-and-insert the twenty four 64KB digital channels comprising a T1 channel to the appropriate outgoing 64KB channels. Video signals would be connected by digital codecs to 1.5MB T1 channels and routed from origin to destination. The DACS was like a "big switch in the sky" and could be programmed by remote terminal from the District Service Center to monitor and change routing patterns to best suit the District needs for any time period.

The capacity between eight locations and the hub at Interfirst was designed to handle six T1 channels, each of which could carry twenty-four 64KB Channels for voice and/or data, or one video channel. Sixteen T1 channels were designed for the route between Interfirst and the District Service Center to accommodate the heavy data traffic to the computing center; the detail recording of switch traffic; and the long distance traffic being centralized at that site. Five campuses and the District Service Center were to be connected to the hub by microwave. The downtown District administrative offices were connected to the El Centro campus under the street by fiber and copper cable. Fiber cable would then connect El Centro under the street to Interfirst. The Eastfield campus would be connected to the District Service Center with 1200 ft. of fiber cable and then routed over microwave to the hub.

The plan also called for acquiring a low-power TV license and an ITFS (Instructional Television Fixed Service) license to replace reliance on local public television and meet future video instructional needs for students and businesses in the county.

A study conducted earlier in 1985 indicated a strong demand for, and demonstrated need for, automating office support functions. Thus, the strategic plan included the procurement of necessary hardware and software to accommodate over five hundred Personal Computer workstations to utilize the integrated digital network. The workstations would be multi-functional performing stand-alone micro software; connected together for office support functions of word

processing, electronic mail, calendaring and scheduling, and document storage and retrieval; and interfaced by the network to the mainframe computers for terminal emulation.

THE PROCUREMENT

Specifications for the digital switches, microwave, and digital cross connect were developed by Diversified Communication Engineering and the office support hardware/software and local data network specifications were prepared by DCCCD personnel. A two-phase sealed bid process was begun in February 1986. The first phase was designed to qualify prospective vendors and select finalists -- the pre-bid conference was attended by twenty eight vendors. Five finalists were chosen for the communication network and two finalists for the office support system from seventeen vendors submitting responses to the RFP. The finalists were asked to make half-day presentations to an evaluation committee to demonstrate their understanding of the project, their organizational experience, and their commitment at the local level to successfully implement.

Following the presentations, sealed bids were again submitted by the finalists. GTE of the Southwest was selected as the General Contractor for the communication network using NEC 2400 digital switches, Harris-Farion microwave, and Rockwell DACS. GTE was chosen for their proven installation experience with complex systems and depth of local support organization. AT&T was chosen as the contractor for a wide area network called ISN (Information System Network). This network would connect over five hundred PC's with twisted pair and fiber cable through packet-switched nodes at each location to a central minicomputer at the District Service Center for office support. Administrative and educational data communications would continue to use multiplexors for now, but would be added to the ISN in the near future. Data General was selected as the office support vendor using an MV 20,000 minicomputer and CEO (Comprehensive Electronic Office) Software. The proposed communication network was approved by the DCCCD Board of Trustees in June 1986.

THE IMPLEMENTATION

The implementation started in June 1986 with bi-weekly planning/progress meetings conducted between the contractors, DCE Consulting Engineers, and DCCCD personnel headed by Jim Hill, Director of Information Technology.

Construction of the network began in August with the first two switches cutover in September. The remaining switches were installed October - December 1986 with the exception of El Centro, which had to be re-wired, and was cutover in February 1987. Concurrent with switch installation, microwave paths were being licensed with the FCC; under-the- street right-of-way was being acquired from the City of Dallas; lease space negotiated at the top of Interfirst Plaza for microwave radios, antennas and DACS; and fiber optic cable being laid. The office support hardware and software was installed in October 1986 and training classes started. The ISN network was installed and operational at each location by March 1987. In April 1987 the microwave equipment was cutover (had been delayed three months from plan for equipment delivery) and the entire network became operational.

In addition to the uniqueness of the software defined digital network using DACS switching, there are a few other significant aspects

- Four digit dialing throughout the Districts nine locations made possible by CCIS (Common Channel Interface System) hardware and software within the NEC 2400 switches
- The use of 56KB data modules used by the NEC switches to route data from the multiplexors and ISN nodes through the switch to interface with the microwave.
- Centralized control of the NEC switches, DACS, and ISN nodes from micros located at the District Service Center--in effect achieving centralized network control for troubleshooting, traffic analysis, and modifications to meet changing conditions.

SUMMARY

The network has been performing extremely well for the past six months and appears to be "rock solid". There are over 2000 telephones of which 550 are new digital instruments with many advanced features; 620 microcomputers serving as multi-function office support workstations; 650 administrative and educational terminals; and digitally compressed video instruction between the District Service Center and Cedar Valley campus all using the integrated services digital network between the nine District locations.

The new ISN wide area network currently supports the microcomputers on the office support network, but all data processing terminals will be added to the network in the next six months. ITFS (Instructional Television Fixed Service) licenses have been acquired and a three-channel system will be installed by May 1988. This will permit video instruction between all campuses, as well as to local business and industry under the direction of the District's Business and Industry Professional Institute. Teleconferences as well as any other video production can be downlinked from satellite and piped over the ITFS Channels to any location.

The District has not been able to obtain a low or high power television license which was planned to replace reliance on local station transmission. The FCC is not allowing any new applications at present, so the only alternative is purchasing the license rights previously granted to another entity. The District is vigorously pursuing this approach but has not been successful to date.

The economic benefit anticipated by the strategic plan looks firm, in that over two million dollars will be saved over the eight year projected life. This savings was calculated considering present use, when in fact projected growth can be handled more economically with the new system, thus realizing even greater savings.

The two and one-half years to plan, procure and implement a state-of-art communication network has been completed with hard work and proven results that puts the District in firm control of its resources. In retrospect, the key ingredients were

- A well represented District planning committee that did a good job in assessing need and developing objectives.
- a competent consultant (Diversified Engineering, Inc.), i.e. an electrical engineer that designed, specified, and coordinated a very complex, but well engineered system.
- a general contractor (GTE of the Southwest) that had the expertise, track record, and local commitment to install and implement on schedule a unique, yet solid, private communication network.

The Dallas County Community College District is proud of the result and convinced that its strategic plan has become reality. The District can contain future costs attributable to inflation and growth; have greatly expanded capabilities and capacity, and benefit from significantly reduced expenses.